

# Exhibit W

# Portable People Meter

The **Portable People Meter** (PPM), also known as Nielsen Meter, is a system developed by Arbitron (now Nielsen Audio) to measure how many people are exposed or listening to individual radio stations and television stations, including cable television. The PPM is worn like a pager, and detects hidden audio tones within a station or network's audio stream, logging each time it finds such a signal.

Although the makers of the PPM claim that it is more accurate than traditional alternatives like handwritten logs or wired meters, critics have raised issues about its accuracy. Another sales argument is that the device is immune to human forgetfulness, something that can be an issue in studies that rely on self-reporting by test subjects.

There are several parts to the PPM system:

- An encoder that inserts the tones subliminally into a station's or broadcast network's airchain via psychoacoustic masking;
- A monitor that checks that the encoder is working properly;
- The wearable Portable People Meter carried by each panelist;
- A base station for each PPM, where each panelist in the household places it overnight to recharge the battery; and
- A portable recharger for vacations and other trips away from the home base.

The original PPM concept required the base station to be connected to a telephone line to transmit panelists' listening data from the PPM to the collection point. The PPM 360, introduced in 2010, uses cellular telephone technology to accomplish this without the need for a wired telephone service. They also have a motion sensor to detect when the PPM is being worn by an active person: After a period of 30 minutes of no activity, they go into a low-power "sleep" mode to conserve battery life.<sup>[1]</sup>



A Portable People Meter worn by Nielsen Audio panelists to monitor media exposure

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## History

The original concept for the PPM can be traced to a brainstorming session at Arbitron in November 1988. Concerns over the forthcoming move from analog video to high-definition digital television had engineers concerned that the technology then in use would become obsolete overnight. Drawing upon his experience in testing laboratories, Dr. Gerald Cohen proposed embedding an identifying signal in the audio and later decoding it. The rationale was simple. Dr. Cohen argued that audio was less likely to undergo as drastic a change in content and technology as would video, hence any technology developed would not likely to become obsolete in a few years.

The concept was presented to the company at that time and was also written up in a short concept document. A preliminary investigation was undertaken, but the technology was never given serious consideration. The concept was written off and forgotten as Arbitron had larger issues in its competition with the Nielsen Company for television ratings. Arbitron lost that battle and went back to its core business — radio ratings.

Dr. Cohen's idea lay dormant until 1992 when Drs. Richard Schlunt and Patrick Nunally approached Arbitron. Meeting with Ronald Kolessar, Director of Technology, Dr. Cohen and others, they presented a new variation of the idea — selectively embed a code into the frequency spectrum of the baseband audio stream and use digital signal processing in a small wearable device to recover the embedded code buried in what a person watches or hears.

Convinced that that concept could be achieved, Mr. Kolessar obtained denial from Arbitron's management to undertake a fast-track effort to determine feasibility. Lacking the internal expertise to do so, additional outside help from Martin Marietta was sought. Facing cutbacks in the defense industry, Martin Marietta agreed to take on commercial business even to the point of signing away all rights to the technology they were to develop. Engineers at Martin Marietta decided that the best approach was to employ the principle of psychoacoustics to mask the embedded code signal, an approach described in U.S. Patent 5,450,490 (<https://www.google.com/patents/US5450490>).

Now a full-fledged project having management support, development by engineers at Arbitron focused on improving the encoding and detection methodology and miniaturization into a hand-held device. Additional capabilities such as motion detection were added later on.

In 2008, EE Times, as part of their *Great Minds, Great Ideas* project, profiled Mr. Kolessar as the "Inventor of the Portable People Meter".

## Research reports

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The PPM is attempting to provide new insights into how audiences respond to the various programming elements radio stations offer. Arbitron, as well as other firms that provide research and consulting services to radio stations, have begun publishing numerous studies based on analysis of PPM data.

The PPM is an electronic measurement system that delivers empirical, verifiable audience measurement data. These results are sometimes at odds with the results generated with the diary method in which listeners were asked to note each change of their radio dial. Some minority diarists may have used their diaries as a way to support and show loyalty for stations that targeted their communities.<sup>[2]</sup> Around 2008, the Spanish Radio Association in the US (SRA) and a number of politicians challenged Arbitron as to the PPM's accuracy in measuring minority listening.<sup>[3]</sup>

## Criticism

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Some radio producers have seen their audience numbers plummet in cities where Arbitron adopted the PPM. Arbitron settled with five states that brought discrimination suits and promised more representative sampling. Radio host Delilah blamed the device for "horrendous" damage to her measured audience numbers.<sup>[4]</sup> One potential culprit raised by critics is the psychoacoustic masking techniques used to embed the signal; Delilah, for example, has suggested that the masking causes the signal to get lost in certain styles of music, thus not getting picked up by the PPM and artificially lowering the radio station's listenership.<sup>[4]</sup>

Nielsen introduced eCBET In 2016, which they touted as an enhancement for the tone encoding process.<sup>[5]</sup> Consequently, there have been some complaints from some in the radio industry that the upgrade caused the audio to sound harsh and unlistenable.<sup>[6][7]</sup>

## See also

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- Numeris
- Single-source data

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## External links

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